

CLAIMS

I/We Claim:

- 1. A voltage-controlled oscillator, comprising:
 - a plurality of cascaded voltage-controlled oscillator cells, each voltage-controlled oscillator cell having a plurality of outputs, each voltage-controlled oscillator cell further comprising:
 - a pair of source coupled nMOS transconductor transistors;
 - a bias transistor coupled between a ground voltage and the source coupled nMOS transconductor transistors;
 - a pair of varactors coupled to a control voltage and the pair of source coupled nMOS transconductor transistors;
 - a pair of drain coupled pMOS transistors, the pair of drain coupled pMOS transistors coupled between a supply voltage and the pair of source coupled nMOS transconductor transistors; and
 - a common mode feedback circuit, the common mode feedback circuit further comprising:
 - a resistive network, the resistive network having a plurality of coupled resistors, each resistor coupled to one of the plurality of outputs of each voltage-controlled oscillator cell; and
 - an op-amp, the op-amp connected to the resistive network, the op-amp generating an output voltage corresponding to a variance between the voltage-controlled oscillator cells and a reference voltage on a reference voltage output, the reference voltage output being coupled to each bias transistor in the plurality of cascaded voltage-controlled oscillator cells.

2. The voltage-controlled oscillator of claim 1, wherein the pair of varactors are MOS voltage-controlled capacitors.

3. The voltage-controlled oscillator of claim 1, wherein the pair of varactors are p-n junction voltage-controlled capacitors.

4. The voltage-controlled oscillator of claim 1, wherein the control voltage is provided at least in part by a charge pump circuit.

5. The voltage-controlled oscillator of claim 1, wherein the control voltage is provided at least in part by a loop filter circuit.

6. The voltage-controlled oscillator of claim 1, wherein the control voltage is provided at least in part by a phase frequency detector circuit.

7. The voltage-controlled oscillator of claim 1, wherein the control voltage is provided at least in part by a charge pump coupled with a loop filter circuit coupled with a phase frequency detector circuit.

8. The voltage-controlled oscillator of claim 1, wherein the plurality of cascaded voltage-controlled oscillator cells consists of three cascaded voltage-controlled oscillator cells.

9. A voltage-controlled oscillator, comprising:
a plurality of cascaded voltage-controlled oscillator cells, each voltage-controlled oscillator cell having at least one output, each voltage-controlled oscillator cell further comprising:
a first pair of coupled transistors;
a bias transistor coupled to the first pair of coupled transistors;

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at least one voltage-controlled capacitor coupled to a control voltage
and to the first pair of coupled transistors; and
a second pair of coupled transistors, the second pair of coupled
transistors further coupled to the first pair of coupled
transistors.

10. The voltage-controlled oscillator of claim 9, further comprising:
a common mode feedback circuit, the common mode feedback circuit
further comprising:
a resistive network, the resistive network having a plurality of
coupled resistors, each resistor coupled to the at least one
output of each voltage-controlled oscillator cell; and
an op-amp, the op-amp connected to the resistive network, the op-
amp generating an output voltage corresponding to a
variance between the voltage-controlled oscillator cells and a
reference voltage on a reference voltage output, the
reference voltage output being coupled to each bias
transistor in the plurality of cascaded voltage-controlled
oscillator cells.

103 11. The voltage-controlled oscillator of claim 9, wherein the pair of
varactors are MOS voltage-controlled capacitors.

103 12. The voltage-controlled oscillator of claim 9, wherein the pair of
varactors are p-n junction voltage-controlled capacitors.

✓ 13. The voltage-controlled oscillator of claim 9, wherein the control
voltage is provided at least in part by a charge pump circuit.

✓ 14. The voltage-controlled oscillator of claim 9, wherein the control voltage is provided at least in part by a loop filter circuit.

✓ 15. The voltage-controlled oscillator of claim 9, wherein the control voltage is provided at least in part by a phase frequency detector circuit.

✓ 16. The voltage-controlled oscillator of claim 9, wherein the control voltage is provided at least in part by a charge pump coupled with a loop filter circuit coupled with a phase frequency detector circuit.

✓ 17. The voltage-controlled oscillator of claim 9, wherein the plurality of cascaded voltage-controlled oscillator cells consists of three cascaded voltage-controlled oscillator cells.

✓ 18. A method for reducing jitter in a voltage-controlled oscillator having a plurality of voltage-controlled oscillator cells, each voltage-controlled oscillator cell having a plurality of output voltage waveforms, the method comprising:

combining each of the output voltage waveforms to produce a combined waveform;

deriving a common mode feedback waveform from the combined waveform and from a reference waveform; and

transmitting the common mode feedback waveform to each of the plurality of voltage-controlled oscillator cells.

✓ 19. A voltage-controlled oscillator having a plurality of voltage-controlled oscillator cells, each voltage-controlled oscillator cell having a plurality of output voltage waveforms, comprising:

combining means for combining each of the output voltage waveforms to produce a combined voltage;

deriving means for deriving a common mode feedback voltage from the combined voltage and a reference voltage; and
transmitting means for transmitting the common mode feedback voltage to each of the plurality of voltage-controlled oscillator cells.

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20. A wireless communications device, comprising:
a voltage-controlled oscillator having a plurality of cascaded voltage-controlled oscillator cells, each voltage-controlled oscillator cell having at least one output, each voltage-controlled oscillator cell further comprising:
a first pair of coupled transistors;
a bias transistor coupled to the first pair of coupled transistors;
at least one voltage-controlled capacitor coupled to a control voltage and the first pair of coupled transistors; and
a second pair of coupled transistors, the second pair of coupled transistors further coupled to the first pair of coupled transistors.

21. The voltage-controlled oscillator of claim 20, further comprising:
a common mode feedback circuit, the common mode feedback circuit further comprising:
a resistive network, the resistive network having a plurality of coupled resistors, each resistor coupled to the at least one output of each voltage-controlled oscillator cell; and
an op-amp, the op-amp connected to the resistive network, the op-amp generating an output voltage corresponding to a variance between the voltage-controlled oscillator cells and a reference voltage on a reference voltage output, the reference voltage output being coupled to each bias

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transistor in the plurality of cascaded voltage-controlled oscillator cells.

103 22. The voltage-controlled oscillator of claim 20, wherein the pair of varactors are MOS voltage-controlled capacitors.

103 23. The voltage-controlled oscillator of claim 20, wherein the pair of varactors are p-n junction voltage-controlled capacitors.

24. The voltage-controlled oscillator of claim 20, wherein the control voltage is provided at least in part by a charge pump circuit.

102 25. The voltage-controlled oscillator of claim 20, wherein the control voltage is provided at least in part by a loop filter circuit.

26. The voltage-controlled oscillator of claim 20, wherein the control voltage is provided at least in part by a phase frequency detector circuit.

27. The voltage-controlled oscillator of claim 20, wherein the control voltage is provided at least in part by a charge pump coupled with a loop filter circuit coupled with a phase frequency detector circuit.

10 28. The voltage-controlled oscillator of claim 20, wherein the plurality of cascaded voltage-controlled oscillator cells consists of three cascaded voltage-controlled oscillator cells.

10 10 rev 10 29. A high-speed serial data link semiconductor chip, comprising:
a voltage-controlled oscillator having a plurality of cascaded voltage-controlled oscillator cells, each voltage-controlled oscillator cell

having at least one output, each voltage-controlled oscillator cell further comprising:

a first pair of coupled transistors;

a bias transistor coupled to the first pair of coupled transistors;

at least one voltage-controlled capacitor coupled to a control voltage and the first pair of coupled transistors; and

a second pair of coupled transistors, the second pair of coupled transistors further coupled to the first pair of coupled transistors.

30. The semiconductor chip of claim 29, further comprising:

a common mode feedback circuit, the common mode feedback circuit further comprising:

a resistive network, the resistive network having a plurality of coupled resistors, each resistor coupled to the at least one output of each voltage-controlled oscillator cell; and

an op-amp, the op-amp connected to the resistive network, the op-amp generating an output voltage corresponding to a variance between the voltage-controlled oscillator cells and a reference voltage on a reference voltage output, the reference voltage output being coupled to each bias transistor in the plurality of cascaded voltage-controlled oscillator cells.

31. The semiconductor chip of claim 29, wherein the pair of varactors are MOS voltage-controlled capacitors.

32. The semiconductor chip of claim 29, wherein the pair of varactors are p-n junction voltage-controlled capacitors.

33. The semiconductor chip of claim 29, wherein the control voltage is provided at least in part by a charge pump circuit.

102 34. The semiconductor chip of claim 29, wherein the control voltage is provided at least in part by a loop filter circuit.

35. The semiconductor chip of claim 29, wherein the control voltage is provided at least in part by a phase frequency detector circuit.

36. The semiconductor chip of claim 29, wherein the control voltage is provided at least in part by a charge pump coupled with a loop filter circuit coupled with a phase frequency detector circuit.

D 37. The semiconductor chip of claim 29, wherein the plurality of cascaded voltage-controlled oscillator cells consists of three cascaded voltage-controlled oscillator cells.

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